Branigan, Terence

From:	Anson Keller <akeller@ofwlaw.com>
Sent:	Monday, January 08, 2018 4:13 PM
To:	'To: Cooney, Nigel (ENRD'; Gary H. Baise; 'LAshack@cityofjeff.net'; Beth Admire; '; Bajor, John; Bahr, Ryan; Fericelli, Paul; Rog, Morgan; Branigan, Terence; Anson Keller
Cc:	Anson Keller; Gary H. Baise
Subject:	Second set of sanswers
Attachments:	FINAL EPA DOJ Responses 1.8.pdf; Attachment B - WW Technology Fact Sheet Balasted Floculation.pdf; Attachment C - Section 11 of the LTCP.pdf; Attachment D - Actiflo Installation List.pdf; Attachment E - Tenth St LS Pump Specs.pdf; Attachment F - Tenth St LS Pump Submittal.pdf; Jeffersonville 2nd set of answers. lwa 2 edits.docx

Lady and Gentlemen,

I attach the response to your latest set of questions to the City of Jeffersonville.

I you have any questions, please let me know.

Anson Keller
Counsel for Jeffersonville

From: Len Ashack [mailto:lashack@CityofJeff.net]
Sent: Monday, January 08, 2018 4:41 PM
To: Anson Keller
Subject: Jeffersonville's Response Letter

Anson
Attached is the Responses to the EPA Technical Questions along with Attachments B, C, D, E & F. Attachments A & G will be overnighted to Nigel Cooney, Beth Admire, Jack Bajor and Dave Tennis as they need to be printed as 24-in X 36-in documents to assure that the necessary resolution visible.
Please let me know if you have any questions.
Thank you

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January 8, 2018

City of Jeffersonville's Responses to the List of Technical Questions Regarding Jeffersonville LTCP Amendment Proposal.

The following list of questions is being submitted to Jeffersonville by U.S. EPA and IDEM regarding the proposal outlined in Jeffersonville's October 20, 2017 letter and October 24, 2017 supplement. These questions relate solely to the technical/engineering aspects of Jeffersonville's outlined LTCP amendment proposal. These questions are meant to continue the information exchange but are not intended to constitute an exhaustive list of questions or concerns that U.S. EPA and IDEM may have regarding Jeffersonville's submittals to date. These questions do not reflect U.S. EPA's and IDEM's concerns regarding Jeffersonville's financial justification for an LTCP modification; nor do these questions presuppose that that a financial case for LTCP modification has been adequately demonstrated.

1. The current LTCP contains 1 annual CSO event to the Ohio River and 3 to Cane Run. Table 1 of the letter lists 2 annual events to the Ohio River with an asterisk as 1 event every six months. Please explain. Is modeling information available for independent agency review? If the proposed CSO volume reductions are expected, why are the typical year events increased?

   The approved November 2010 and April 2011 revision to the March 2010 LTCP recommended CSO controls that would provide a 6-month level of control for the Ohio River and indicated that a 6-month level of control should result in approximately two overflows per year during a typical year. However, the typical year simulation resulted in only one overflow so the overflow volume corresponding to two overflows was estimated by doubling the typical year simulation results.

   XPSWMM models (including all input files, output files, rainfall files and background maps) are available for review. Available models include:
   - *LTCP models (previously reviewed by SAIC),*
   - *2014 80% Design model, and*
   - *2017 Revised Scenario models.*

   The 2014 80% Design model resulted in fewer overflow events but more overflow volume than the 2017 Revised Scenario model because of more storage volume and less treatment capacity. The 2014 80% Design model included approximately 2.9MG of storage and treated up to 35 MGD of combined sewage while the 2017 Revised Scenario includes approximately 1.1 MG of storage and treats up to 50 MGD of combined sewage. The 2014 80% Design Model provided more storage volume which decreased the overflow events while it provided less treatment capacity which increased the overflow volume.

2. **Please provide a current flow diagram of the downtown WWTP (including the headworks), and please provide a flow diagram showing the proposed sewer layouts for the 10th Street PS and downtown WWTP (including the CEHRT), including the proposed point of sampling for the recombined effluent.**

Attached please find the following drawings as contained in ***Attachment A*** *(Attachment A will be sent under separate cover – 24"x36" sheets)*

<u>Record Drawings</u>
C-4 Existing Piping Plan;
M-4 Influent Channel Modifications showing the Influent Force Mains (36-in and 30-in from Tenth Street Lift Station, 24-in Force Mains from both the Mill Creek and Spring Street Lift Stations and an 8-in Force Main from Krunchers;
C-4 Piping Plan showing the Proposed Piping Modifications;
M-22 Showing the proposed sampling location of the combined effluent;
Process Schematic showing the current treatment processes;
Process Schematic showing the DWWTP with influent flow between 0.0 and 25.0 MGD;
Process Schematic showing the DWWTP with influent flow between 25.0 and 50.0 MGD; and
Process Schematic showing the DWWTP with influent flow between 50.0 and 75.0 MGD.

3. **Will wet weather flow be screened prior to entering the proposed CEHRT? If yes, please describe the plans to provide screening to the wet weather flow going into the proposed CEHRT. Is a new screening unit to be constructed for the influent CEHRT?**

Yes.
<u>Dry Weather Flow</u>
During periods of dry weather all of the flow pumped into the DWWTP flows through one of three (3) fine screens. Before flowing to one of three (3) grit removal tanks. The design flow of these systems is 50 MGD.
<u>Wet Weather Flow</u>
The wastewater entering the Tenth St. Lift Station will flow through the headworks structure which contains both two (2) 25 MGD fine screens. The screened wastewater will then flow to the two (2) grit tanks before entering the wet well in the lift station. Once in the wet well, the flow will be pumped to the DWWTP for treatment, either through the treatment plant or through the CEHRT treatment system and the WWTP. The design flow of the screens and grit tanks at the Tenth Street Lift Station is 50 MGD.

4. **Please explain the engineering justification for the proposed size of the CEHRT. Was the justification based on a design storm, and if so what year was used as a Typical Year or what design storm was used?**

The CEHRT was sized based on the difference between the capacity of the Tenth Street Lift Station (maximized at 50 MGD) and the 50 MGD WWTP capacity available to treat combined sewage (36 MGD from the Tenth Street Lift Station and 14 MGD from the Mill Creek and Spring Street Lift Stations). The design of the CEHRT system was selected to be 25 MGD which is based on the peak 24-Hr flow at the DWWTP during periods of sustained wet weather. The 25 MGD CEHRT and UV system will provide operational flexibility during dry weather when the CEHRT will be used for phosphorus removal

5. **Will the recombined effluent comply with the POTW's effluent limits even during wet weather? What assumptions /flows were considered in the submittal Jeffersonville made to IDEM for phosphorus controls are those the same assumptions being used for evaluating treatment for wet weather flows?**

The NPDES permit for the DWWTP contains limits for $CBOD_5$, TSS, Ammonia-nitrogen, Phosphorus, pH, Dissolved Oxygen, and E. coli. The limits for CBOD5, TSS and Ammonia-nitrogen have a monthly average and a weekly maximum limit, see Table 1 below. Phosphorus has a monthly average limit. These parameters are based on a 24-hr composite sample. 7-days per week. pH, Dissolved Oxygen and E. coli are grabs samples. The E. coli limit is from April 1 through October 31 during the recreational season (See Table 2).

TABLE 1

Parameter	Quantity or Loading: Monthly Average	Weekly Average	Units	Quantity or Concentration: Monthly Average	Weekly Average	Units	Monitoring Requirements: Measurement Frequency	Sample Type	
Flow [1]	Report	-----	MGD	----	----	----	Daily	24-Hr	Total
$CBOD_5$									
Summer [2]	4,173	6,259	lbs/day	10	15	mg/L	Daily	24-Hr	Composite
Winter[3]	10,431	16,690	lbs/day	25	40	mg/L	Daily	24-Hr	Composite
TSS									
Summer [2]	5,007	7,511	lbs/day	12	18	mg/L	Daily	24-Hr	Composite
Winter[3]	12,518	18,776	lbs/day	30	45	mg/L	Daily	24-Hr	Composite
Ammonia-N									
Summer [2]	626	960	lbs/day	1.5	2.3	mg/L	Daily	24-Hr	Composite
Winter[3]	1,252	1,878	lbs/day	3.0	4.5	mg/L	Daily	24-Hr	Composite
Phosphorus									
Interim [4]	----	----	----	Report	----	mg/L	Daily	24-Hr	Composite
Final [4]	----	----	----	1.0	----	mg/L	Daily	24-Hr	Composite

TABLE 2

Parameter	Quality of Concentration: Daily Minimum	Monthly Average	Daily Maximum	Units	Monitoring Requirements: Measurement Frequency	Sample Type
pH [5]	6.0	----	9.0	s.u.	Daily	Grab
Dissolved Oxygen [6]	6.0	----	----	mg/L	Daily	8 Grabs/24 Hrs
E. coli [7]	----	125	235	cfu/100ml	Daily	Grab

[1] Effluent flow measurement is required per 327 IAC 5-2-13. The flow meter(s) shall be calibrated once every twelve months.

[2] Summer limitations apply from May 1 through November 30 of each year.

[3] Winter limitations apply from December 1 through April 30 of each year.

[4] Refer to the Schedule of Compliance in Part I.D of this permit.

[5] One grab sample per day

[6] The daily minimum concentration of dissolved oxygen in the effluent shall be the reported as the arithmetic mean of the lowest dissolved oxygen reading taken at three (3) hour intervals and determined by the summation of the eight (8) daily dissolved oxygen readings divided by the number of daily readings. The dissolved oxygen readings are to be collected and recorded every three (3) hours.

[7] The effluent shall be disinfected on a continuous basis such that violations of the applicable bacteriological limitations (E. coli) do not occur from April 1 to October 31, annually. The E. coli limitations and monitoring requirements apply from April 1 through October 31annually. The monthly average E. coli value shall be calculated as a geometric mean.

Historically, the wet weather flow to the Tenth St. Lift Station only lasts for few hours, thus the City believes that based on the past performance of the wastewater treatment plant in 2016 and

2017 that the combined effluent will meet the NPDES permit limits with the addition of the CEHRT system.

The annual average effluent CBOD5 was 2.2 mg/L in 2016 and 2.3mg/l in 2017 with the weekly average of 3.2 mg/L in both 2016 and 2017. The annual average effluent TSS was 4.1 mg/L in 2016 and 4.4 mg/L in 2017. The weekly average 6.7 mg/L in 2016 and 8.7 mg/L in 2017. The effluent ammonia-N was 0.06 mg/l in 2016 and 0.05 mg/L in 2017 with the weekly averages of 0.88 mg/L and 0.16 mg/L 2016 and 2017 respectively.

*A review of the operating data from 2014-2017 shows the influent concentrations for CBOD5, TSS, NH3-N and phosphorus decrease as the wet weather flow increases. Using the Performance of the CEHRT identified in EPAs Wastewater Technology Fact Sheet (Office of Water EPA 832-F-03-010, June 2003) Table 4 – **Attachment B**, the City expects the following removal rates.*

BOD Removal	***TSS Removal***	***TKN Removal***	***Phosphorus Removal***
36 – 62%	*53 – 92%*	*19 – 40%*	*69 – 95%*

Based on the expected removal rates and the potential duration of the wet weather flow, the City firmly believes that the combined effluent will meet the NPDES permit limits as contained in Tables 1 and 2 above.

6. As the proposal requests additional activations, what impacts has the City considered to designated uses of the Ohio River and Cane Run. Which CSO locations will increase its number of activations in the Ohio River and Cane Run?

The Ohio River, City of Jeffersonville and downstream communities would realize less overflow volumes.

2014 80% DESIGN TYPICAL YEAR MODEL RESULTS

Receiving Stream	*CSO Outfall*	*Days*	*Volume (MG)*
Cane Run	*CSO 018 - 10th Street*	*3*	*14.4*
Ohio River	*CSO 009 - Wall Street*	*1*	*2.7*
		Total CSO Volume	***17.1***

2017 REVISED SCENARIO TYPICAL YEAR MODEL RESULTS

Receiving Stream	*CSO Outfall*	*Days*	*Volume (MG)*
Cane Run	*CSO 018 - 10th Street*	*6*	*9.5*
		Cane Run Total	***9.5***
Ohio River	*CSO 008 - Spring Street*	*5*	*1.2*
	CSO 009 - Wall Street	*3*	*0.2*
	CSO 010 - Walnut Street	*2*	*0.1*
	CSO 011 - Meigs Avenue	*1*	*0.1*
	CSO 021 - Mechanic Street	*5*	*2.4*
	CSO 013 - Graham Street	*4*	*0.2*
		Ohio River Total	***4.2***
		Total CSO Volume	***13.7***

7. Based on the proposed LTCP amendment (increased frequency of untreated CSO discharges, but higher volumes captured), has the City considered how Indiana Water Quality Standards would be affected? Are there limitations involving the State of Kentucky as well as Indiana? Which CSO locations discharge into sensitive areas and/or IDEM-defined priority areas of the Ohio River and Cane Run?

*This issue was addressed in Section 11 (Revised April 2011) of the approved LTCP. The Pollutant of Concern (POC) in respect to water quality issues was E. coli/fecal coliform. The water quality standards from the various agencies (ORSANCO, Kentucky, and Indiana) with respect to recreational activities was discussed in detail in that Section. The ORSANCO and Kentucky Water Quality Standards with regard to the recreational uses of the Ohio River have not changed since the 2011 LTCP Section 11- **Attachment C**.*

8. Are stormwater costs included in the proposed project?

The proposed project being discussed is the size of the CSO Interceptor and the CEHRT system for the Downtown WWTP. The City believes that these projects will provide an increased level of control (less CSO volumes) and these projects can be constructed under the City's current sewer use rate structure. The total cost of the projects is estimated to be Exs. 4 and 7A *will be supported by the current sewer use rates.*

The stormwater projects were included in the Financial Capability Assessment (FCA) dated September 2016 and further discussed in the October 20, 2016 Response Letter.

9. The City is proposing to reduce the East/West interceptor to a 60" sewer and the North/South Interceptor to a 72" interceptor on page 1 of the letter but page 3 refers to the East/West interceptor as being reduced to a 72" sewer with an additional 36" sewer to achieve dry weather scour velocity. Please explain which is correct.

Both are correct. Page 1 describes the scenario being proposed by City of Jeffersonville (72" North/South and 60" East/West) while Page 3 describes the alternative scenario requested by USEPA (72" North/South and 72" East/West). A parallel dry weather flow sewer is recommended for the East/West storage interceptor only if the East/West storage interceptor exceeds 60". If the East/West storage interceptor exceeds 60" in diameter, dry weather flow velocities would be too low to keep solids suspended potentially creating odor and corrosion problems in the larger sewer. As such the City is proposing to keep with the 60" East/West sewer.

10. Page 2, Item 2 in your letter states additional storage volume has been attained in the proposed plan by maximizing the elevations of the CSO regulators along the Ohio River but item 1 on this page states that the proposed plan deceases the storage volume of the interceptor. Please explain. Please detail the regulators involved. Do they include those at CSOs 008, 009, 010, 011, 013, 019, 020 and 021? Can you provide the modeling inputs and

results? Is the new modeling data based on the new regulator elevations and are the proposed improvements available?

Just to be clear, the City does not have nor has it had CSOs numbered 019 or 020 which discharged to the Ohio River or any if its tributaries.

The 2014 80% Design model included a larger Wall Street outfall (to consolidate Ohio River overflow) with a regulator elevation of 430.8. The regulator elevation of 430.8 maximized storage in the proposed 10'x8' storage interceptor but limited storage in the existing upstream trunk sewers. The 2017 Revised Scenario model did not include a larger Wall Street outfall and only included the existing Ohio River outfalls with existing regulator elevations. The existing regulator elevations maximized storage in the proposed 72" storage interceptor (decrease in storage compared to the 10"x8' storage interceptor) but increased storage in the existing upstream trunk sewers (increase in storage).

CSO REGULATOR ELEVATIONS

CSO Outfall	*2014 80% Design Model*	*2017 Revised Scenario Model*
CSO 018 - 10th Street [1]	*429.7*	*429.7*
CSO 008 - Spring Street	*432.5*	*430.45 [2]*
CSO 009 - Wall Street	*432.5*	*434.01 [2]*
CSO 009 - Larger Wall Street[3]	*430.8*	*NA*
CSO 010 - Walnut Street	*432.5*	*431.83 [2]*
CSO 011 - Meigs Avenue	*432.5*	*432.74 [2]*
CSO 021 - Mechanic Street	*432.5*	*430.7 [2]*
CSO 013 - Graham Street	*432.5*	*434.07 [2]*

1) Discharges to Cane Run.
2) Corresponds to existing conditions.
3) Included in the 2017 80% Design model but not the 2017 Revised Scenario models

XPSWMM models (including all input files, output files, rainfall files and background maps) are available for review. Available models include:

- *LTCP models (previously reviewed by SAIC),*
- *2014 80% Design model, and*
- *2017 Revised Scenario models.*

11. What specific type of CEHRT is Jeffersonville proposing? Is there performance history available for the proposed CEHRT clarifier form other current operating locations? What is the anticipated performance criteria for the proposed CEHRT?

At this time the City is considering the Actiflo® CEHRT from Veolia Water. The Reasons that the City is considering Actiflo® for this application are as follows:

- *The Actiflo® will be used during periods of dry weather flow and when the influent wet weather flow is less than 25MG to provide phosphorus removal and can easily be converted to treat the excess wet weather flow from the Tenth St. Lift Station for whatever period until the flow from the Tenth St, LS is less than 35MG and then it will be used for phosphorus removal following the biological system. Refer to* ***Attachment A – Process Flow Schematic.***
- *The Actiflo® small footprint and very short hydraulic residence time and quick treatment within few minutes, Actiflo® easily handles rapid raw water load and/or flow*

fluctuations; and there are numerous applications where it is used.

*The current locations of the Actiflo® systems is contained in **Attachment D**. The other information with regard to performance history will be sent under separate cover as there is a lot of information.*

The City may also consider other CEHRT systems when making the decision on the design of the CEHRT system.

12. Describe the manner in which the plant effluent and CEHRT will operate relative to meeting disinfection requirements contained within the NPDES Permit.

The City is constructing an additional 25 MGD UV unit to disinfect the additional wet weather flow from the Tenth St. Lift Station. The total UV disinfection system will be able to disinfect a flow of 75 MGD during the recreational season. The additional 25 MG UV unit will be located next to the two (2) 25 MG units.

13. Please describe the "flushing mechanism" infrastructure proposed for the 36" low flow sanitary sewer. Include capital and Operation & Maintenance (O&M) costs for the number of units proposed.

The flushing mechanisms are not being proposed for the parallel dry weather flow sewer. The flushing mechanisms are recommended for the storage interceptor but only if the North/South storage interceptor exceeds 84" or the East/West storage interceptor exceeds 60". If the North/South storage interceptor exceeds 84" in diameter, a rectangular configuration would be required and resulting dry weather flow velocities would be too low to keep solids suspended due to the flat bottom. If the East/West storage interceptor exceeds 60" in diameter, resulting dry weather flow velocities would be too low to keep solids suspended due to the lack of flow.

14. Please describe the engineer's probable cost estimate of the increased O&M necessary for the flushing mechanism, CEHRT, odor and hydrogen sulfide controls and other capital improvements necessary with the proposal.

The storage interceptor flushing mechanisms and the parallel dry weather flow sewer are recommended only if the North/South storage interceptor exceeds 84" or the East/West storage interceptor exceeds 60". The flushing mechanisms and parallel dry weather flow sewer have significant costs, will create operational and maintenance challenges, will require enhanced odor and hydrogen sulfide controls, and will not impact CSO activations or volume. The City of Jeffersonville prefers not to include storage interceptor flushing mechanisms or a parallel dry weather flow sewer.

15. Please describe the point of discharge of the POTW in the Ohio River (i.e., Mill Creek's Outfall 022) and the manner in which the recombined effluent is to be sampled during wet weather. Utilizing the anticipated performance criteria of the CEHRT system, discuss the quality of the anticipated combined effluent as compared to existing NPDES permit Limits.

The existing final effluent sampler will be relocated downstream of its existing location to sample the combined effluent when the CEHRT is used to treat the excess flow from the Tenth St. Lift Station. Otherwise, the sampler will sample the effluent from the biological system.

See Drawing M - 22 in Attachment A.

16. Please confirm the peak pumping capacity of the 10th Street Lift Station. It is said to be 50 MGD, but that is the maximum flow to the POTW. What about the pumping capacity for the HRT? The Mill Creek pump station peak rate is 8 MGD, the Spring Street pump station peak rate is 6 MGD. How does this affect the proposed 10th Street pump station pumping capacity of 50 MGD? Is 50 MGD the capacity with all five pumps running?

There may be some confusion regarding the Tenth St. LS and the DWWTP Headworks. The October 24 memo attempted to clarify the capacities of the Mill Creek, Spring St. and the Tenth St. Lift Stations in relation to the DWWTP.

The Mill Creek and Spring St. Lift Stations pump to the headworks of the DWWTP through to separate force mains. The Tenth Street Lift Station has two (2) separate force mains, a 24" (which transitions to a 30" before it discharges to the headworks) and a 36"force main.

Neither Spring St nor Mill Creek Lift Stations pump to the Tenth St. Lift Station. Each of the three lift stations pump directly to the Downtown Wastewater Treatment Plant Headworks Structure. ***See Sheet M-4***

The Tenth Street Lift Station was designed to pump a peak flow of 36,000 gpm (51.84MGD) with all 5 pumps running and both the 24" and the 36" force mains in operation. ***Attachment E*** *contain the specifications for the pumps and Attachment F contains the approved submittal for the pumps at the lift station.*

17. Please provide a map of anticipated growth/ population equivalent projections to the Jeffersonville POTW and describe the manner in which this flow is taken into consideration for the proposed POTW and any planned changes to the collection system.

Attachment G *(<u>this Attachment will be sent as a 24"x36" map under separate cover</u>) is a map of the Service Areas for both the Downtown and the North Wastewater Treatment Plants. The two service are completely separate from each other. Wastewater from the Downtown service area cannot be pumped to the North WWTP for treatment nor can the wastewater from the North Service area be pumped to the Downtown WWTP for treatment.*

The Downtown WWTP and its service area encompasses the older parts of the city including all of the combined sewer service area (CSSA), the North WWTP service area includes all of the new development/growth areas, River Ridge Commerce Center (RRCC) and the Port of Indiana.

In 2007, an anticipated growth /equivalent populations analysis was completed and presented in a Preliminary Engineering Report (PER) that was submitted and approved by IDEM, Indiana Finance Authority (IFA) and the SRF to construction the North WWTP along with new lift stations and force mains to re-route flow from the DWWTP to the North WWTP.

The results of the analysis concluded that the majority, if not all of the residential, commercial, and industrial growth will occur in the North service area. This has allowed the DWWTP to be expanded to treat additional combined sewage flow.

List of Attachments

Attachment A

Record Drawings

C-4 Existing Piping Plan;

M-4 Influent Channel Modifications showing the Influ~~ent Force Mains (36-in and 30~~ in from Tenth Street Lift Station, 24-in Force Mains from both the Mill Creek and Spring Street Lift Stations and an 8-in Force Main from Krunchers;

C-4 Piping Plan showing the Proposed Piping Modifications;

M-22 Showing the proposed sampling location of the combined effluent;

Process Schematic showing the current treatment processes;

Process Schematic showing the DWWTP with influent flow between 0.0 and 25.0 MGD;

Process Schematic showing the DWWTP with influent flow between 25.0 and 50.0 MGD; and

Process Schematic showing the DWWTP with influent flow between 50.0 and 75.0 MGD.

***Attachment B** – EPA Wastewater Technology Fact Sheet – Ballasted Flocculation*

***Attachment C** – Section 11 – Post Construction Monitoring of the 2011 LTCP*

***Attachment D** – Actiflo Installation List*

***Attachment E** – Tenth Street Lift Station Construction Specifications (Pumps)*

***Attachment F** – Tenth Street Lift Station Pump Submittal*

***Attachment G** – Jeffersonville Sewer Service Areas*

EPA

United States
Environmental Protection
Agency

Wastewater Technology Fact Sheet

Ballasted Flocculation

DESCRIPTION

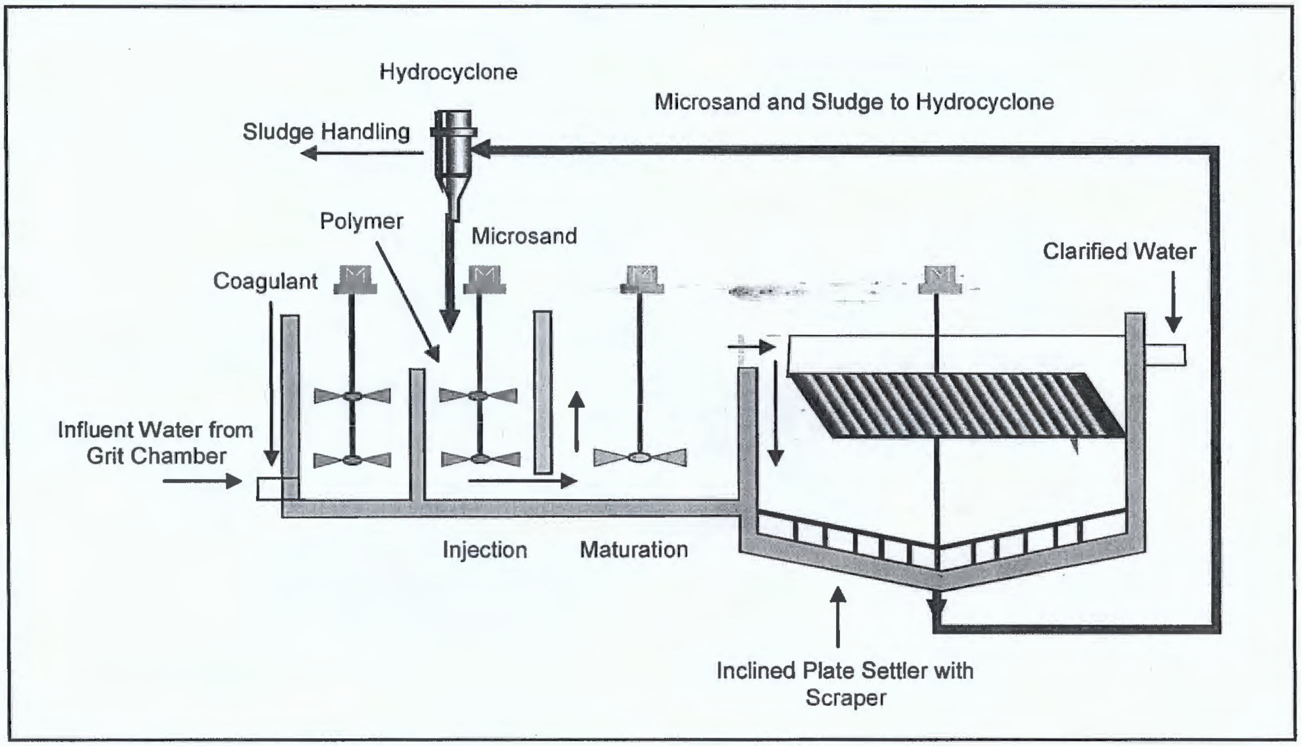
Ballasted flocculation, also known as high rate clarification, is a physical-chemical treatment process that uses continuously recycled media and a variety of additives to improve the settling properties of suspended solids through improved floc bridging. The objective of this process is to form microfloc particles with a specific gravity of greater than two. Faster floc formation and decreased particle settling time allow clarification to occur up to ten times faster than with conventional clarification, allowing treatment of flows at a significantly higher rate than allowed by traditional unit processes.

Ballasted flocculation units function through the addition of a coagulant, such as ferric sulfate; an anionic polymer; and a ballast material such as microsand, a microcarrier, or chemically enhanced sludge. When coupled with chemical addition, this ballast material has been shown to be effective in reducing coagulation-sedimentation time (Liao, et al., 1999). For instance, ballasted flocculation units have operated with overflow rates of 815 to 3,260 $L/m^2 \cdot min$ (20 to 80 $gal/ft^2 \cdot min$) while achieving total suspended solids removal of 80 to 95 percent (Tarallo, et al., 1998).

The compact size of ballasted flocculation units makes them particularly attractive for retrofit and high rate applications. This technology has been applied both within traditional treatment trains and as overflow treatment for peak wet weather flows.

Several different ballasted flocculation systems are discussed in more detail below:

The Actiflo® process (Figure 1), manufactured by US Filter Kruger (US operations) has been used in



Source: Modified from US Filter Kruger, 2002.

FIGURE 1 ACTIFLO® PROCESS DIAGRAM

Europe since 1991 for drinking water, wastewater, and wet weather applications. This three-stage process uses microsand particles (45-100 μm in diameter) to enhance the flocculation process.

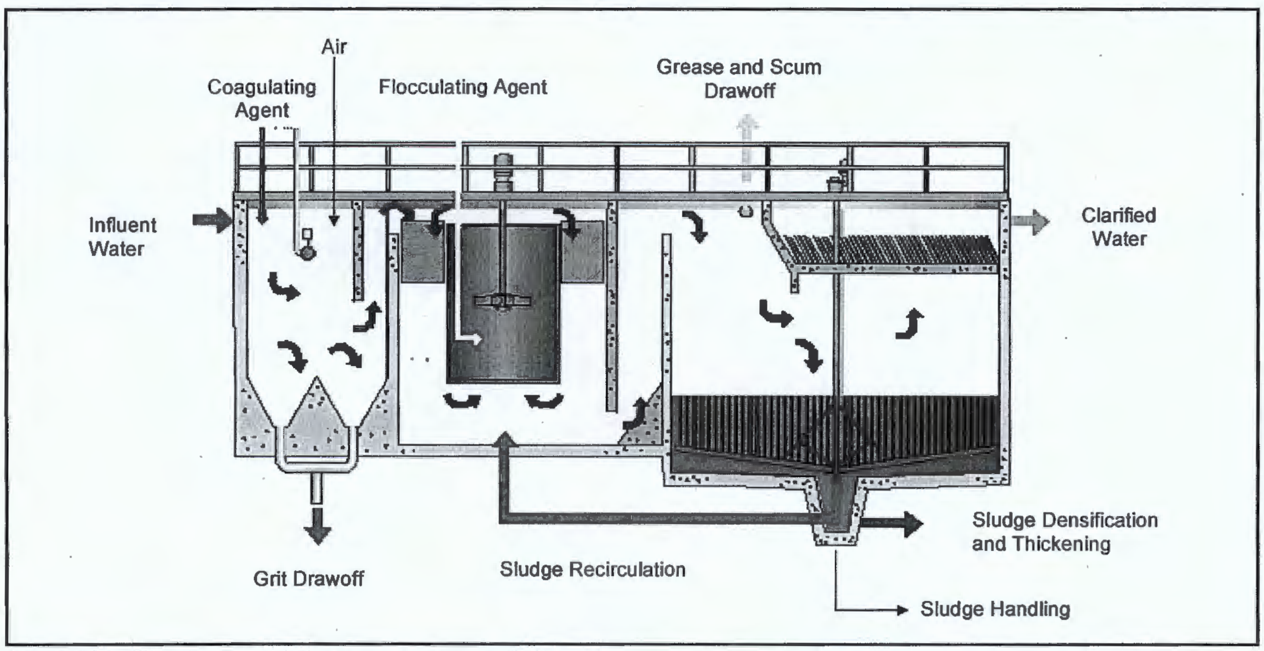
Prior to entering the first stage of the Actiflo® process, the influent wastewater is usually screened and passed through a grit chamber to remove large particulates. The next step is the addition of a traditional metal coagulant in a flash mixer. Iron or aluminum coagulants are used to reduce phosphorus levels, typically to below 2 mg/L. Within this first stage, a polymer and microsand (the ballast materials) are also added.

The second stage of the Actiflo® process is maturation, where the ballast material serves to enhance floc formation, resulting in a much faster settling rate relative to traditional coagulants. The influent wastewater then flows to a second tank where it is gently mixed with chemical flocculants and ballast to enhance the flocculation process.

The third stage of the Actiflo® process is clarification. During this stage, the mixed influent and the floc flow downward through the unit. The floc settle by gravity to the bottom of the unit where they are collected, typically in a cone-shaped chamber. A baffle is used to direct the flow to the top of the tank for further settling. Inclined tube settlers further enhance the settling process by providing a greater surface area over which settling can occur and by reducing settling depth. Clarified effluent is then directed to the next process treatment or to discharge. Ballast from the bottom of the chamber is separated from the sludge and re-introduced into the contact chamber. A hydrocyclone uses centrifugal force to separate the sludge from the ballast and re-introduces it into the contact chamber. The sludge is taken to an appropriate handling facility.

Marketed by Infilco Degremont, Inc., of Richmond, Virginia, and first installed in 1984, the DensaDeg® process, shown in Figure 2, is a high-rate clarifier designed for grit removal, grease removal, settling, and thickening. The DensaDeg® reuses recirculated sludge in combination with a flocculating agent to achieve rapid settling. Like the Actiflo® system, the first step in the DensaDeg® process involves the injection of a traditional coagulant into the system. However, unlike the Actiflo® system, the DensaDeg® process uses injected air rather than flash mixing to disperse the coagulant. The DensaDeg® 4D uses the same technology and processes as the DensaDeg® but can handle flows with the rapid start-up and shut-down time frame typically required for stormwater, combined sewer overflow (CSO), and sanitary sewer overflow (SSO) applications.

In the coagulation zone of the DensaDeg®, air is



Source: Modified from ONDEO-Degremont, Inc., 2002.

FIGURE 2 DENSADEG 4D PROCESS DIAGRAM

simultaneously injected with the coagulant to separate grit particles from organic matter and to provide fluid motion for coagulant dispersion and mixing. Coagulated wastewater enters the reactor where a polymer flocculating agent is added with recycled settled sludge to help the flocculation process. In the reaction zone, wastewater enters a clarifer where grease and scum are drawn off the top. In the final step of the process, inclined tube settling is used to remove residual floc particles. Settled sludge from the clarifier is thickened, and part of this sludge is recirculated and added to the flocculate. Because this system uses entirely recycled sludge as a coagulant aid, it does not require separation techniques (hydrocyclone) to recover microsand from the sludge.

The Lamella® plate clarification system, which is manufactured by the Parkson Corporation of Ft. Lauderdale, Florida, is usually used in conjunction with non-proprietary coagulation and flocculation units rather than as a single flocculation and clarification process. The Lamella® system does not include a microcarrier, but enhanced coagulation aids (ballast materials) can be used with this system to achieve enhanced high-rate clarification. This system uses a series of inclined plates to increase the surface area over which particles can settle out. Because the plates are stacked at an incline, the depth from which they must settle is significantly less than those of traditional clarifiers. This decreases settling time compared to that of traditional clarifiers, allowing much higher flow rates to be treated. A thickener can be added to the Lamella® unit to increase the concentration of solids in the resulting sludge. Like the DensaDeg® system, underflow sludge can be routed back to the flocculation unit for use as a ballast material.

Like other ballasted processes, the Lamella® system can be used in either new designs or retrofits to achieve high rate clarification. The advantages of other systems incorporating the use of a microcarrier are also applicable to the Lamella® system. Figure 3 shows a typical Lamella® system.

APPLICABILITY

Ballasted flocculation can be used as part of a traditional treatment train or as a parallel treatment train in new or existing wastewater facilities. Applications of ballasted flocculation include:

1. Enhanced primary clarification.

2. Enhanced secondary clarification following fixed and suspended growth media biological processes.

3. Peak flow reduction for CSO and SSO treatment. This process has been applied to a variety of wastewater facilities ranging from less than 0.1 MGD to more than 1,000 MGD, both as a parallel train and as a means of optimizing existing unit processes (Infilco Degremont, 2000).

ADVANTAGES AND DISADVANTAGES

Advantages

Major advantages for both new and upgraded treatment operations include:

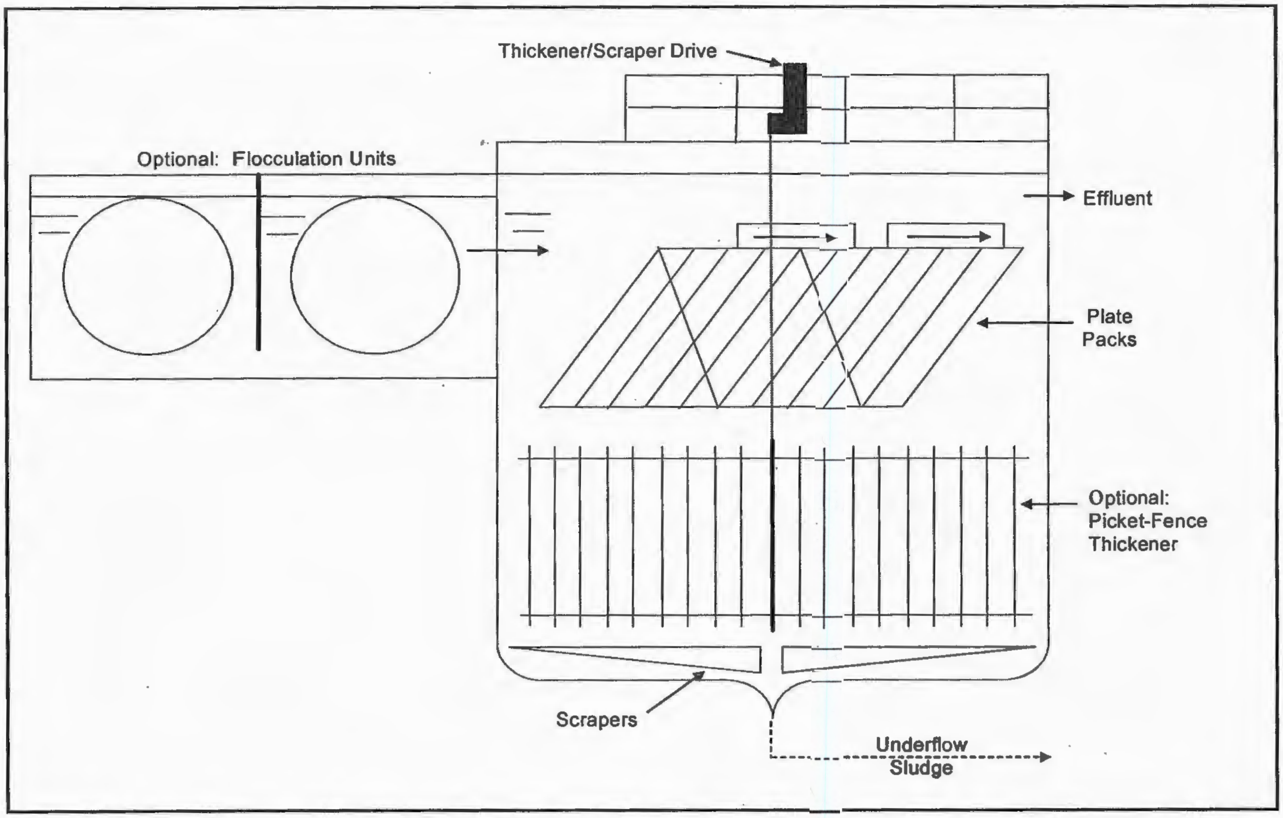
- The reduced surface area of the clarifiers minimizes short-circuiting and flow patterns caused by wind and freezing (a problem only in extremely cold climates).

- Systems using ballasted flocculation can treat a wider range of flows without reducing removal efficiencies.

- Ballasted flocculation systems reduce the amount of coagulant used, or improve settling vs. traditional systems for comparable chemical usage.

In CSO and SSO applications:

- Ballasted flocculation requires less land than a storage tank of comparable capacity. The compact size of the clarifier can significantly reduce land acquisition and construction costs.



Source: Parsons, Inc., from Parkson Corporation, 2000.

FIGURE 3 LAMELLA® PLATE SETTLERS

- Operational costs are incurred only during use.

- These systems do not require conveyance of flow to wastewater treatment plants following wet-weather events (if secondary treatment requirements do not apply).

- Ballasted flocculation systems can be used as primary treatment facilities for primary rehabilitation or replacement projects.

Disadvantages

Some disadvantages of ballasted flocculation systems include:

- They require more operator judgment and more complex instrumentation and controls than traditional processes.

- Pumps may be adversely affected by ballast material recycle. Lost microsand or microcarrier must be occasionally replaced (except where settled sludge is recycled for use as a microcarrier/ballast).

For CSO and SSO applications:

- Systems require significantly more operation and chemical feed than a comparable storage tank of similar capacity.

- Use of ballasted flocculation systems results in low removal rates during the start-up period (typically 15 to 20 minutes after a wet weather event).

- The process may take several hours to achieve the optimal chemical dose and hence, the desired pollutant removal.

- This is a relatively new technology for CSO/SSO abatement without a history of long-term performance.

DESIGN CRITERIA

The Actiflo® can process flows between 10 and 100 percent of its nominal design capacity, allowing systems to provide wet weather treatment for a range of design storm events. Typical start-up to steady-state time is about 30 minutes. Table 1 shows additional design parameters for the Actiflo® system.

The DensaDeg® unit has been successfully applied to treat hydraulic loads of 20 to 40 $m^3/m^2 \cdot h$ (11,800 to 23,600 $gal/ft^2 \cdot d$). Start-up to steady state times range from 15 to 30 minutes. Within the grit removal coagulation reactor, a high solids concentration (>500 mg/L) is maintained. Settling rates within the clarifier are as high as 2,450 $L/m^2 \cdot min.$ (60 $gal/ft^2 \cdot min.$). The solids removed from the clarifier/thickener are typically 3 to 8 percent dry solids. Additional thickening is not required in most cases. Table 1 provides additional design parameters for the DensaDeg®.

Loading rates used in conventional settlers can typically be applied directly to sizing Lamella® settlers by substituting the projected area for the surface provided by a conventional clarifier (Parkson, 2000). The surface area depends upon the angle of plate inclination, with typical applications at about 55 degrees. Lamella® plate packs are proportioned to the clarification and thickening area by adjusting the plate feed point.

The ratio of clarification to the thickening area is determined from representative wastewater samples (Parkson, 2000).

PERFORMANCE

Pilot studies were conducted for both the Actiflo® and DensaDeg® 4D processes to evaluate their pollutant removal abilities.

The Actiflo® process was evaluated at the Airport Wastewater Treatment Plant in Galveston, Texas, under both wastewater and CSO simulated conditions. Table 2 summarizes removal rates for both influent conditions.

The DensaDeg® 4D process was evaluated by the Village Creek WWTP in Birmingham, Alabama, as a method of treating peak flows. Pilot studies were conducted to determine optimum operating parameters. During testing, primary effluent was selected to best represent SSO influent (with the assumption that a surge tank with a detention time of two hours would collect SSO volume before being discharged to the DensaDeg® for treatment). Table 3 lists removal efficiencies achieved under optimum steady-state operating parameters.

The city of Fort Worth, Texas, conducted pilot tests of several ballasted flocculation treatment processes during the design of a new treatment facility for peak flow treatment. Results indicated that every tested process achieved a higher degree of pollutant removal when compared to conventional preliminary treatment. Table 4 shows the removal efficiencies of different

TABLE 1 DESIGN PARAMETERS FOR BALLASTED FLOCCULATION SYSTEMS

Parameter	Actiflo®	DensaDeg®	DensaDeg® 4D
Microsand (percent of peak raw water flow) or Ballasted Sludge	45-150 μm	0.5-4.0%	0.5-4.0%
Overflow Rate	2,450 $L/m^2 \cdot min.$	up to 450 $L/m^2 \cdot min.$	up to2,040 $L/m^2 \cdot min.$
Reactor Retention Time	3-5 minutes	6 minutes	4-6 minutes
Total Retention Time	4-7 minutes	22 minutes	15 minutes
Minimum Single Train Capacity	0.2 MGD	0.8 MGD	8 MGD
Maximum Multiple Train Capacity	Unlimited	Unlimited	Unlimited
Maximum Single Train Capacity	90 MGD	24 MGD	100 MGD

Source: US Filter, 2000 and Infilco Degremont, 2000.

TABLE 2 PERFORMANCE OF ACTIFLO® PROCESS AT GALVESTON, TEXAS

	TSS Removal	COD % Removal	BOD % Removal
Raw Wastewater	71-95%	66-87%	55-88%
CSO Simulated	80-94%	65-83%	48-75%

Source: US Filter Kruger, 2000.

treatment technologies during this pilot study.

OPERATION AND MAINTENANCE

In general, proper operation of a ballasted coagulation and flocculation system requires greater operator expertise than does operation of conventional coagulant systems because the addition of ballast requires close monitoring of the recycle. The short retention time also requires prompt operator response to maintain design conditions and to provide optimum coagulant dosages.

For wet weather applications, maintenance requirements for ballasted flocculation units are greater than for traditional storage tanks, which retain wet weather volume for subsequent treatment. Wet weather suspended solids concentrations vary, and require monitoring and adjustment of the microsand concentration and overflow rate. As with non-wet weather applications, the polymer dose, coagulant doses, and pH of coagulation should be closely monitored to ensure design conditions are met.

Most systems recover and recycle the ballast material using a hydrocyclone. It is important to ensure proper operation and maintenance of the hydrocyclone to avoid accumulation of organic material on the sand particles. This does not occur in systems that use only sludge recycle.

TABLE 3 REMOVAL EFFICIENCIES OF THE DENSADEG® 4D PROCESS AT BIRMINGHAM, AL WWTP

Parameter	Influent Range (mg/L)	Effluent Range (mg/L)	Removal Efficiency
COD	112-260	44-168	45-60%
TSS	47-86	3-11	80-95%

Source: Tarallo, et al., 1998.

COSTS

The compact design of ballasted flocculation units reduces land acquisition costs when compared to conventional treatment trains, reducing capital costs, especially where land acquisition is expensive or prohibitive. However, operational costs can be higher than for comparable conventional processes. For wet weather applications, operational costs are incurred only during peak flow conditions. Capital and operating costs vary depending on the specific treatment application. In Fort Worth, Texas, capital costs for ballasted flocculation were \$0.05/L treated (\$0.20/gal) with operating costs of \$24/million L treated (\$90.85/million gal) (Camp, Dresser & McKee, 1999).

REFERENCES

Other Related Fact Sheets

Chemical Precipitation
EPA 832-F-00-018
September 2000

Other EPA Fact Sheets can be found at the following web address:
http://www.epa.gov/owm/mtb/mtbfact.htm

1. Camp, Dresser & McKee, Inc., 1999. *High Rate Clarification Saves Fort Worth $34* Million. Internet site at http://www.cdm.com/Svcs/wastewtr/balfloc.htm, accessed 2000.

TABLE 4 REMOVAL EFFICIENCIES OF TREATMENT TECHNOLOGIES AS PILOT TESTED FOR THE CITY OF FORT WORTH, TEXAS

Unit/Manufacturer	BOD Removal	TSS Removal	TKN Removal	Phosphorus Removal
Actiflo®	36-62%	74-92%	25-30%	92-96%
DensaDeg®	37-63%	81-90%	28-40%	88-95%
Lamella®	41-57%	53-73%	19-34%	69-76%

Source: Crumb and West, 2000.
Note: A fourth system, Microsep®, was evaluated but is no longer manufactured.

2. Crumb, F.S. and R. West, 2000. *After the Rain*, Water Environment and Technology, April 2000.

3. Infilco Degremont, 2000. Design information on the DensaDeg system.

4. Liao, S.-L., Y. Ding, C.-Y. Fan, R. Field, P.C. Chan, and R. Dresnack, 1999. *High Rate Microcarrier-Weighted Coagulation for Treating Wet Weather Flow.* Water Environment and Technology Poster Symposium, New Orleans, LA.

5. Parkson Corporation, 2000. Principle of Lamella Gravity Settler.

6. Tarallo, S., M. W. Bowen, A. J. Riddick, and S. Sathyamoorthy, 1998. *High Rate Treatment of CSO/SSO Flows Using a High Density Solids Contact Clarifier/Thickener-Results from a Pilot Study.*

7. US Filter Kruger, 2000. Design information on the Actiflo® process for wastewater.

ADDITIONAL INFORMATION

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EPA 832-F-03-010
June 2003

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MUNICIPAL TECHNOLOGY BRANCH

SECTION 11
POSTCONSTRUCTION COMPLIANCE MONITORING
(REVISED APRIL 2011)

11.01 GENERAL

A postconstruction compliance monitoring program is required by current regulations to monitor the effectiveness of CSO controls and to verify protection of water quality to support the designated use. Federal CSO policy and Indiana law (SEA 431 and SEA 620) also require a postconstruction compliance monitoring program to evaluate the feasibility of implementing additional cost-effective CSO controls, specifically for LTCPs involving temporary suspensions of the designated use. Every five years, an update of the LTCP is recommended. The update will include an assessment of the data collected in this monitoring program and address any modifications to the postconstruction compliance monitoring program.

Jeffersonville has relied on the ORSANCO Louisville-area wet weather demonstration study to collect water quality data. Additional CSO sampling was conducted by Jeffersonville in 2007.

The LTCP-recommended alternative includes providing additional conveyance and storage to reduce the number of overflows while providing full biological (secondary) treatment of combined sewage at the Jeffersonville downtown WWTP. According to the combined sewer system hydraulic model, the recommended Phase 3 alternative (Alternative 4 Scenario 61) should provide a 4-month level of control for Cane Run and a 6-month level of control for the Ohio River. A 4-month level of control for Cane Run means that no untreated combined sewage should be discharged to Cane Run during rainfall events with statistical return periods of less than or equal to 4 months resulting in approximately three CSOs a year during a typical year after LTCP implementation. A 6-month level of control for the Ohio River means that no untreated combined sewage should be discharged to the Ohio River during rainfall events with statistical return periods of less than or equal to 6 months resulting in approximately two CSOs a year during a typical year after LTCP implementation. The number of untreated CSOs in a typical year will be used as one measure of performance for the completed improvements. The actual number of overflows in any year is , dependent on the continuum and magnitude of precipitation events. The model-predicted performance of the improvements for the "typical year" (December 2000–November 2001) includes one discharge to the Ohio River and three discharges to Cane Run.

This Postconstruction Compliance Monitoring Plan will detail data collection intended to allow for measuring the effectiveness of controls and the impacts on water quality in the receiving streams. Data collection efforts are presented for the following items.

1. CSO occurrences and flows.
2. Rainfall.
3. CSO quality.
4. Discharge stream sampling.
5. WWTP Compliance.

11.02 CSO FLOW MONITORING

The City has installed and maintains flow meters on its active CSO discharges. Data is collected on the time of discharge, duration of discharge, and volume of discharge. This data was required by the Consent Decree, the LTCP hydraulic model calibration process, and the NPDES permit.

This Postconstruction Compliance Monitoring Plan includes maintaining the ability to collect this information with flow meters on each active outfall. No monitors are recommended on the flood pumping station discharge locations. During the Market Street interceptor replacement project, the City may reconstruct the overflow structures and install alternate types of flow metering equipment, such as level sensing (secondary device) and a fixed overflow weir (primary device).

Table 11.02-1 indicates the recommended data collection for CSO flow monitoring.

CSO Outfall	Recommended Monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
008 (Spring Street) 009 (Wall Street) 010 (Walnut Street) 011 (Meigs Avenue) 021 (Mechanic Street) 013 (Graham Street) 018 (Tenth Street Pumping Station)	Automatic flow meters.	Continuous for each discharge event.	Through 2026 or longer as may be required by NPDES permit.	Meters are installed and will be maintained. Replacement of area velocity meters should be considered when the overflow regulators are replaced as part of the Market Street Interceptor Sewer Project.
019 (Meigs Flood Pumping Station) 020 (Woerner Flood Pumping Station)	None	N/A	N/A	Report occurrence if any. Estimate duration and volume.

Table 11.02-1 Recommended CSO Flow Monitoring

11.03 RAINFALL MONITORING

The City has installed and maintains three tipping-bucket rain gauges in the vicinity of its combined sewer collection system to record the time-specific intensity of rainfall. Rainfall data is collected and telemetered to the WWTP SCADA system. This data was required by the Consent Decree, the LTCP hydraulic model calibration process, and the NPDES permit. This Postconstruction Compliance Monitoring Plan includes maintaining the ability to collect this information with strategically located rain gauges. Table 11.03-1 indicates the recommended data collection for rainfall monitoring.

Location	Recommended Monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
Tenth Street Pumping Station Louise Street Pumping Station Spring Street Pumping Station	Tipping-bucket rain gauges with data stored in WWTP SCADA system	Continuous	Through 2026 or longer as may be required by NPDES permit	The City may adjust locations, but a minimum of three gauges is recommended.

Table 11.03-1 Recommended Rainfall Monitoring

11.04 CSO SAMPLING

The LTCP has established the pollutant of concern as bacteria. No additional parameters warrant monitoring. Samples should be collected periodically from the discharge of the remaining CSO outfalls (008, 009, 010, 011, 021, 013, and 018). One sampling event is recommended each year to monitor improvement in the quality of discharges over time. One location should be sampled for Ohio River CSOs (008, 009, 010, 011, 021, or 013) and the Cane Run outfall (018) should be monitored. The preferred sampling location of the river CSOs is Walnut Street (010) because it is representative of all the Ohio River CSOs and provides for safe access. This location should be consistent for the duration of this Postconstruction Compliance Monitoring Plan. As the LTCP-recommended plan is implemented, the number of occurrences is expected to diminish and the City will have to be responsive during one of only a few overflow events each year. While it is the goal of the City to collect samples from CSOs once a year, this may not be practical each year.

Grab samples should be collected and analyzed for the duration of the overflow event. The first grab sample should be collected within the first hour of overflow and grab sampling should continue at a frequency of every two hours if CSO discharge continues. Samples should be delivered promptly to the laboratory to allow the bacteriological testing to begin within four hours of the sample collection. The City plans to analyze the samples for *E. coli* during the recreation season (May through October) and for fecal coliform during the nonrecreation season (November through April). Analytical testing should follow the latest approved method. The recommended CSO overflow sampling is listed in Table 11.04-1.

CSO Outfall	Recommended monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
010 (Walnut Street) Representative of Ohio River CSOs	Grab sampling for *E. coli* and fecal coliform to begin within 1 hour of overflow initiation and continue with new samples every 2 hours if CSO discharge continues.	Once a year	Through 2026 or longer as may be required by NPDES permit	Use the latest approved analytical method. Start analysis within 4 hours of sample collection. Results should be reported as a geometric mean for each event. *E. coli* will be analyzed from May through October and fecal coliform will be analyzed from November through April.
018 (Tenth Street Pumping Station)				

Table 11.04-1 Recommended CSO Overflow Sampling

11.05 RECEIVING STREAM SAMPLING

The water quality pollutant of concern is bacteria. Water quality standards exist for each receiving stream from its respective regulatory agency. Table 11.05-1 identifies the standard in place at this time.

TABLE 11.05-1

WATER QUALITY STANDARDS (IN STREAM)

	Indiana	Kentucky	ORSANCO
Ohio River			
***E. coli* in Recreational Season (May through October)**			
Monthly Average Geometric Mean	125/100 mL based on not less than five samples per month (applies April through October).	130/100 mL based on not less than five samples per month.	130/100 mL based on not less than five samples per month.
Monthly Maximum	NA	240/100 mL in more than 20 percent of the samples taken during the month.	NA
Single Sample Maximum	Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period (April through October).	NA	NA
	235/100 mL if fewer than ten samples were collected (applies April through October).	NA	240/100 mL
Fecal coliform in Recreational Season (May through October)			
Monthly Average Geometric Mean	NA	200/100 mL based on not less than five samples.	200/100 mL based on not less than five samples.
Monthly Maximum	NA	400/100 mL in more than 20 percent of the samples taken during the month.	400/100 mL in more than 10 percent of the samples taken during the month.
Single Sample Maximum		NA	NA
Fecal Coliform in non Recreational Season (November through April)			
Monthly Average Geometric Mean	NA	1,000/100 mL based on not less than five samples per month.	2,000/100 mL based on not less than five samples.
Monthly Maximum	NA	2,000/100 mL in more than 20 percent of the samples taken during the month.	
Cane Run			
***E. coli* in Recreational Season (April through October)**			
Monthly Average Geometric Mean	125/100 mL based on not less than five samples per month.	NA	NA
Single Sample Maximum	Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters (April through October).		
	235/100 mL if fewer than ten samples were collected.	NA	NA

The LTCP anticipates reclassification of Cane Run with a "CSO wet weather limited use" designation. This designation would allow for water quality standards to be temporarily suspended to a higher allowable concentration for a specified period of time following a CSO discharge.

Samples should be collected regularly from the upstream and downstream locations in the Ohio River and Cane Run. Sampling frequency is proposed to allow for a comparison of water quality against the standards listed in Table 11.05-1. Recreational water sampling is recommended for a minimum of 10 days a month. Recreational Water Quality Sampling is planned for each Tuesday, Wednesday, and Thursday. Ohio River sampling locations are recommended upstream of the CSO discharges (between Duffy's Landing and Graham Street) and at one downstream location (Second Street bridge). Ohio River sampling locations were selected to minimize the likelihood that Louisville MSD's CSOs would impact the sample. Cane Run cannot be sampled upstream of the 96-inch sewer outfall since it creates the creek, but one sample should be collected from the creek at the floodwall a minimum of 10 days a month if flow is observed in the 96-inch outfall. The sampling of Cane Run may be difficult since the WWTP effluent is being diverted to Mill Creek. During dry weather conditions, Cane Run may have very little flow and sampling may not be representative. Thus, sampling at Cane Run will only be conducted when the City is contributing a measurable flow to the creek as determined by the area-velocity flow meter installed on the 96-inch sewer. When the City samples Cane Run, the City will also sample the 96-inch outfall sewer near Interstate 65.

The safety of staff will be considered prior to any sample collection, and Jeffersonville may elect to temporarily suspend sampling when conditions are deemed unsafe. Figure 11.05-1 identifies the recommended sampling locations. Table 11.05-2 lists the recommended receiving stream sampling program.

11.06 WWTP DISCHARGE MONITORING

The City will utilize sampling and flow data collection as required by its NPDES permit to demonstrate the adequacy of treatment. The existing permit requires reporting of daily flows and sampling seven days a week for conventional pollutant parameters (biochemical oxygen demand, total suspended solids, and ammonia nitrogen), bacterial contamination (*E. coli*), and other parameters (pH and dissolved oxygen). The sampling and reporting required by permit are adequate to monitor the effectiveness of treatment as part of the LTCP.

11.07 PERFORMANCE MEASURE COMPARISONS

The data collected will be used to compare the actual conditions to anticipated conditions and water quality standards.

POST-CONSTRUCTION COMPLIANCE MONITORING
SAMPLING LOCATIONS

COMBINED SEWER OVERFLOW LONG-TERM CONTROL PLAN
CITY OF JEFFERSONVILLE, INDIANA

STRAND ASSOCIATES, INC.
ENGINEERS

FIGURE 11.05-1
5994.030

TABLE 11.05-2

RECOMMENDED RECEIVING STREAM SAMPLING

CSO Outfall	Recommended Monitoring	Frequency of Monitoring	Duration of Monitoring	Comment
Ohio River				
Upstream Site (Duffy's Landing) Downstream Site (Second Street Bridge)	Grab sampling for *E. coli* and fecal coliform. For Days with no CSO discharge sampling–one sample. For days with CSO discharge sampling (once per year, see Table 11.04-1)–one sample prior to overflow and samples collected promptly after CSO outfall samples and taking the last river sample at least one hour following the end of CSO discharge.	Samples to be collected each Tuesday, Wednesday and Thursday. A minimum of 10 samples per month per location, and coincident with annual CSO sampling, year round.	Through 2026	Use the latest approved analytical method. Start analysis within 4 hours of sample collection.
Cane Run				
Quasi-Upstream Site (in 96-inch at I-65) Downstream Site (At floodwall)	Grab sampling for *E. coli*. For Days with no CSO discharge sampling–one sample. For Days with no CSO discharge sampling–one sample if there is flow in the 96-inch sewer. For days with CSO discharge sampling (once per year, see Table 11.04-1)–one sample prior to overflow and samples collected promptly after CSO outfall samples and taking the last river sample at least one hour following the end of combined sewer overflow.	Samples to be collected each Tuesday, Wednesday and Thursday. A minimum of 10 samples per month per location, and coincident with annual CSO sampling, year round. Number of samples may be less if there is no flow into Cane Run from Jeffersonville.	Through 2026	Use the latest approved analytical method. Start analysis within 4 hours of sample collection.

The following performance measure comparisons will be used to indicate the overall success of the improvements.

1. Number of untreated CSO discharges in a typical year: During and after LTCP implementation, the City will compare actual system performance against both hydraulic model predictions and consider the statistical recurrence of precipitation events. The hydraulic model prepared for the LTCP will be updated to reflect the CSO abatement alternative as constructed to allow the City to compare actual outfall data to the performance predicted by the hydraulic model. The model will require accurate, discrete rainfall data. The model calibration objective was ± 20 percent and comparisons of actual results need to reflect the intended calibration and the potential that rainfall may not be uniform. If simulated CSO discharges are less than measured CSO discharges, the combined sewer system hydraulic model will be updated to reflect the CSO abatement alternative as constructed and recalibrated/revalidated as necessary.

   During precipitation events in the postconstruction monitoring program, the following data would be collected for each event: (1) 15-minute rainfall data from an appropriate number and (2) distribution of rain gauges; overflow volumes, duration, and frequency at each CSO location; and (3) predefined water quality sampling in the receiving water (for predefined parameters and at predefined locations).

   As necessary, the City will revise the model configuration and attributes to accurately reflect CSO controls as built. The City will run the hydraulic model using the rainfall data and CSO activation/flow/duration data collected during the monitoring period to assess whether the model reasonably predicts the overflows as actually observed during this monitoring period.

   If the model's simulation of the postconstruction monitoring period does not validate the model's ability to accurately represent the CSO controls' performance, the City will use the same postconstruction monitoring rainfall data and CSO activation/flow/duration data to calibrate the model so that it reasonably predicts the CSO activation frequency and volumes observed in the postconstruction monitoring program, and the modeled output does not predict fewer activations than those observed during the postconstruction monitoring period.

   When it has been verified the model is adequately calibrated, the model will be run again for the predefined typical year to see how many overflow events are predicted to occur.

   Using the typical year rainfall data, if the model simulation predicts the number of overflow events that meet the CD/LTCP listed performance (such as < X overflow events in a typical year), the LTCP defined performance is deemed as met.

If the number of overflow events predicted by the model for the typical year exceeds the CD/LTCP listed performance, the LTCP defined performance will be deemed as not met.

All CSO producing wet-weather events will also be evaluated to determine the statistical return period and whether a CSO discharge should have occurred (>or= 6-month for Ohio River CSO and >or= 4-month for Cane Run CSO). If CSO discharge occurs during rainfall events with statistical periods less than the performance criteria, an evaluation will be performed to determine why the discharge occurred and the best course of action to correct the factor(s) causing the CSO.

The City may determine the need to revise this proposed Postconstruction Compliance Monitoring Plan as improvements are made and conditions change. In the event the City increases the amount of monitoring, the results will be reported in semiannual reporting. In the event the City proposes to decrease the amount of sampling or otherwise change any aspect of the CSO monitoring, approval from USEPA and IDEM will be sought.

Lastly, the residual overflows will need to be evaluated if sampling has indicated water quality is still not met. This will require resolution with state and federal regulators to see if any additional work is warranted.

2. Total CSO Volume: The actual annual volume of CSO will be totaled and compared to historical volumes. The hydraulic model may be used to compare the anticipated annual overflow volume to the actual annual overflow volume.

3. Percent Capture: The actual annual percent capture of combined sewage can be computed and compared to the anticipated percent capture. The hydraulic model may be used to compare the anticipated annual percent capture to the actual annual percent capture.

4. Water Quality: The water quality data collected can be used to compare to water quality standards. Improvement as a result of the LTCP should be discernable over time.

Rainfall patterns and intensities vary from year to year, and the results from any one year cannot be expected to demonstrate compliance. Jeffersonville will average annual data from at least four consecutive years to compare to expected benchmarks.

11.08 REPORTING

The City is required by the Consent Decree to prepare and submit semiannual reports to USEPA. This reporting mechanism will be used to summarize data collected and the performance measure evaluation. The City anticipates summarizing the efforts made in each semiannual report and documenting the results and assessment for the previous calendar year in its July 1 reporting.

SECTION 44 42 58

SUBMERSIBLE PUMPS AND ACCESSORIES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Pumps
   1. The Contractor shall furnish, install, and test all pumping units and their appurtenances as indicated on the Drawings and as herein specified. The pumps, mechanical seals, motors, power cables, close coupled volutes, cast iron discharge elbows and guide bar brackets provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.
   2. These specifications direct attention to certain features of the pumping units, but do not purport to cover all the details of their design. The equipment furnished shall be designed, constructed, and erected in conformity with accepted high quality standards.

B. Instrumentation and Controls:
   1. It is the intent of this specification to provide a complete pump control system for the pump station including integration of the variable frequency drives (see Specification Section 26 29 23). All components specified or required for a complete, operable system shall be included.

C. All pumps as indicated in this section of the work herein specified include:
   1. Pipe and pipe fittings.
   2. Installation.
   3. Supports, anchors and seals.
   4. Concrete, grouting.
   5. Instrumentation.
   6. Electrical.
   7. Adjustment and start-up.

D. Pump Data:
   1. Pump capacities and other operation data are indicated on the pump schedule included herein.
   2. Insofar as possible, pumps of the same type shall be the product of one manufacturer.
   3. Pumping units shall be equipped with the necessary accessories, including lifting attachments, lubricators, and drainage connections.

1.2 RELATED SECTIONS

A. Section 01 86 23 – Process Control Performance Requirements

B. Section 26 29 23 – Variable Frequency Drives

C. Section 26 32 13 – Engine Generators

H. The sequence of operation shall be as follows:

Rising Wet Well Level

Stage	Wet Well Elevation (ft)	Pump Status	Approximate Total Flow (GPM)	Approximate TDH (ft)
0	406.0	All OFF	0	0
1	409.0	1st On at Min Hz	*	*
2	410.0	1st ramps up	*	*
3	411.5	1st at full speed	*	*
4	413.0	1st reduced speed 2nd ON reduced speed	*	*
5	414.5	1st reduced speed 2nd reduced speed 3rd ON reduced speed	*	*
6	416.0	1st at full speed 2nd at full speed 3rd at full speed	22,750	94.8
7	417.0	1st at full speed 2nd at full speed 3rd at full speed 4th ON at full speed	32,700	88.4
8	418.0	1st at full speed 2nd at full speed 3rd at full speed 4th at full speed 5th ON at full speed ALARM	36,000	99.4

* Flow condition varies depending upon which force main condition is in use. See Operational description in Section 01 86 23.

Falling Wet Well Level

Stage	Wet Well Elevation (ft)	Pump Status	Approximate Total Flow (GPM)	Approximate TDH (ft)
8	418.0	1st at full speed 2nd at full speed 3rd at full speed 4th at full speed 5th at full speed	36,000	99.4
0	406.0	All OFF	0	0

10th Street Pump Station
Summary Sheet 08/03/2011

Pump Curves

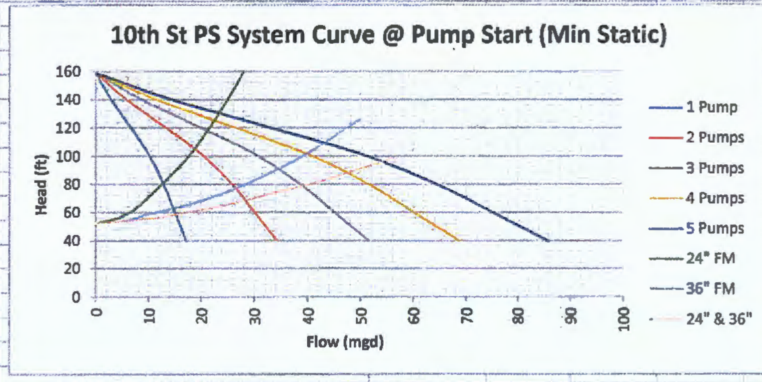
H (ft)	1 Pump (mgd)	2 Pumps (mgd)	3 Pumps (mgd)	4 Pumps (mgd)	5 Pumps (mgd)
159	0	0	0	0	0
140	2.91	5.82	8.73	11.64	14.55
120	6.65	13.30	19.95	26.60	33.25
100	10.28	20.56	30.84	41.12	51.40
80	12.89	25.78	38.67	51.56	64.45
60	15.03	30.06	45.09	60.12	75.15
40	17.19	34.38	51.57	68.76	85.95

Static Head Calcs

DWWTP Influent WSE (avg), 470.08 - 1.58	468.50
10th St PS Wet Well WSE (Pump Start)	416.00
Min Static (ft)	52.50
DWWTP Influent WSE (avg), 470.08 - 1.58	468.50
10th St PS Wet Well WSE (Pump Stop)	410.00
Max Static (ft)	58.50

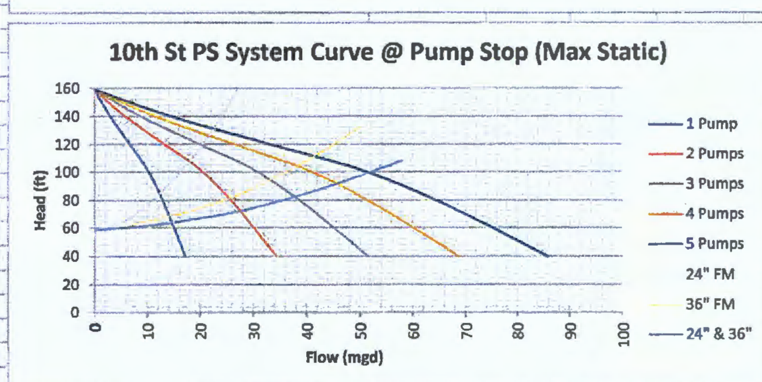
System Curves @ Pump Start (Min Static)

Q (mgd)	24" FM H (ft)	36" FM H (ft)	Q (mgd)	24" & 36" H (ft)
0	52.50	52.50	0	53
5	57.39	54.20	11	56
10	70.65	58.96	17	60
20	111.30	68.38	23	64
30	174.89	83.00	32	72
40	260.19	102.41	44	84
50	366.34	126.32	57	100



System Curves @ Pump Stop (Max Static)

Q (mgd)	24" FM H (ft)	36" FM H (ft)	Q (mgd)	24" & 36" H (ft)
0	58.50	58.50	0	59
5	63.39	60.20	11	62
10	76.65	64.96	15	64
20	117.30	74.38	27	72
30	180.89	89.00	39	84
40	266.19	108.41	52	100
50	372.34	132.32	58	108



List of Attachments

Attachment A

Record Drawings

C-4 Existing Piping Plan;

M-4 Influent Channel Modifications showing the Influ~~ent Force Mains (36-in and 30~~ in from Tenth Street Lift Station, 24-in Force Mains from both the Mill Creek and Spring Street Lift Stations and an 8-in Force Main from Krunchers;

C-4 Piping Plan showing the Proposed Piping Modifications;

M-22 Showing the proposed sampling location of the combined effluent;

Process Schematic showing the current treatment processes;

Process Schematic showing the DWWTP with influent flow between 0.0 and 25.0 MGD;

Process Schematic showing the DWWTP with influent flow between 25.0 and 50.0 MGD; and

Process Schematic showing the DWWTP with influent flow between 50.0 and 75.0 MGD.

***Attachment B** – EPA Wastewater Technology Fact Sheet – Ballasted Flocculation*

***Attachment C** – Section 11 – Post Construction Monitoring of the 2011 LTCP*

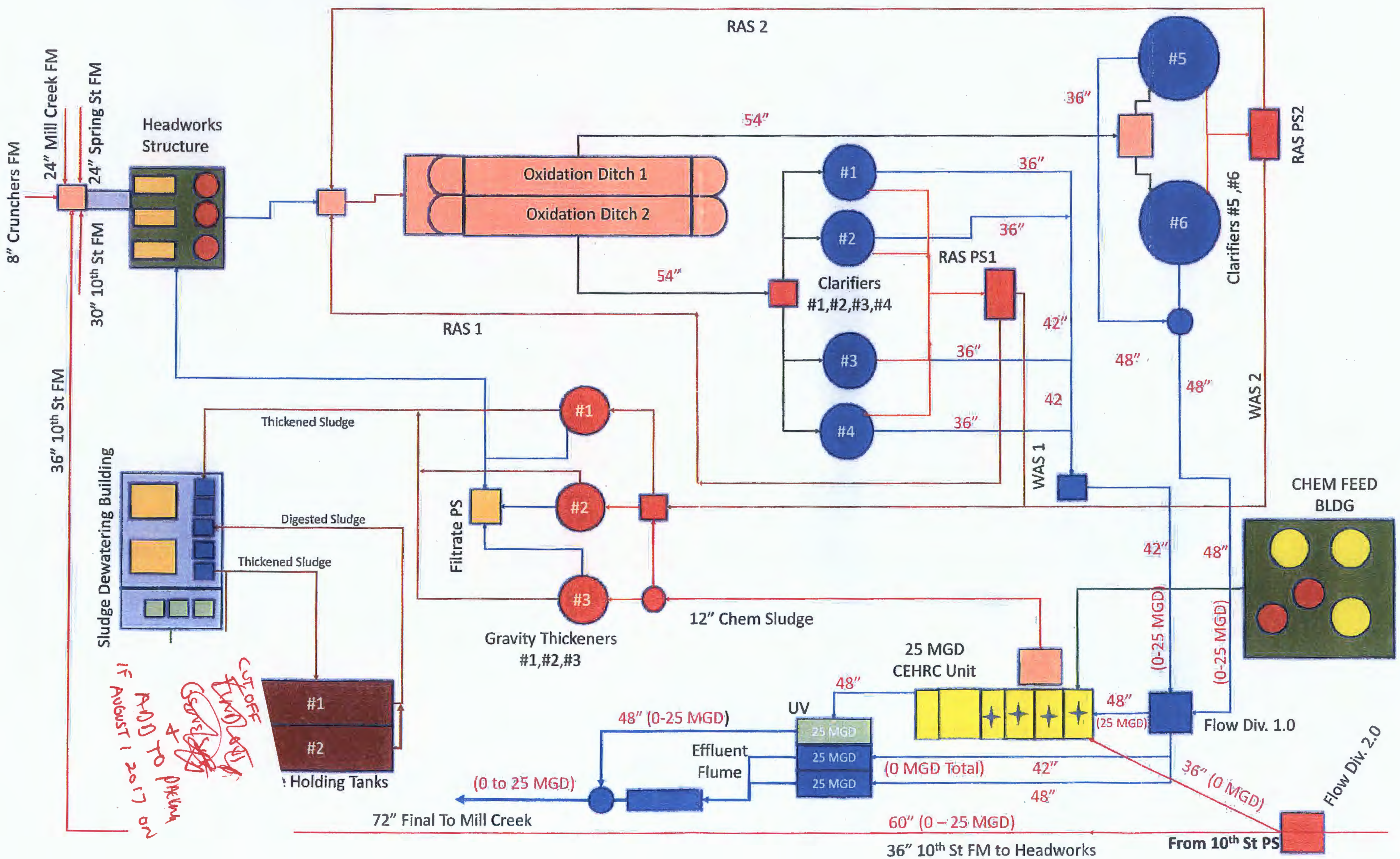
***Attachment D** – Actiflo Installation List*

***Attachment E** – Tenth Street Lift Station Construction Specifications (Pumps)*

***Attachment F** – Tenth Street Lift Station Pump Submittal*

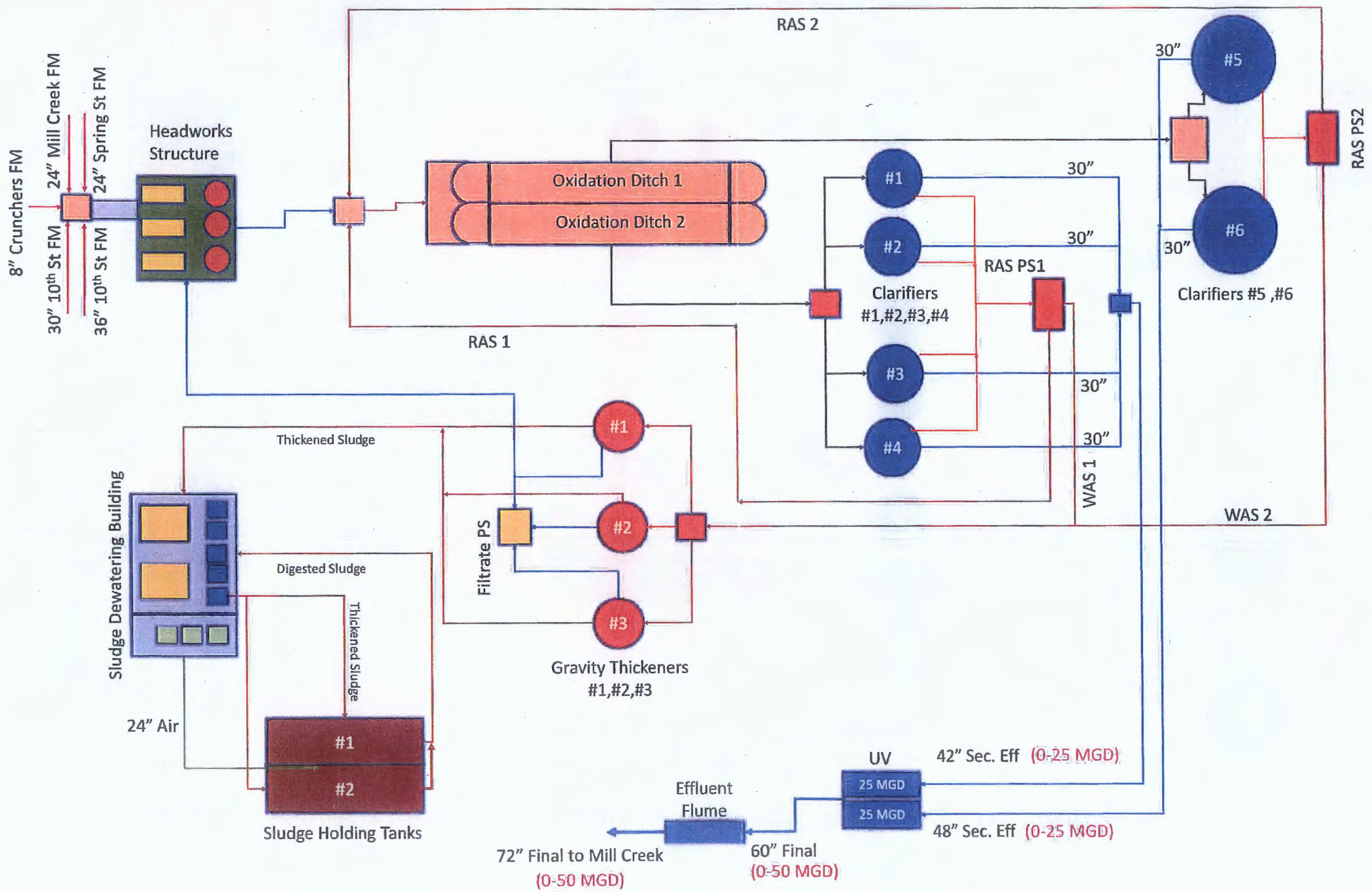
***Attachment G** – Jeffersonville Sewer Service Areas*

Downtown WWTP – Proposed Situation – Between 0.0 and 25.0 MGD Flow

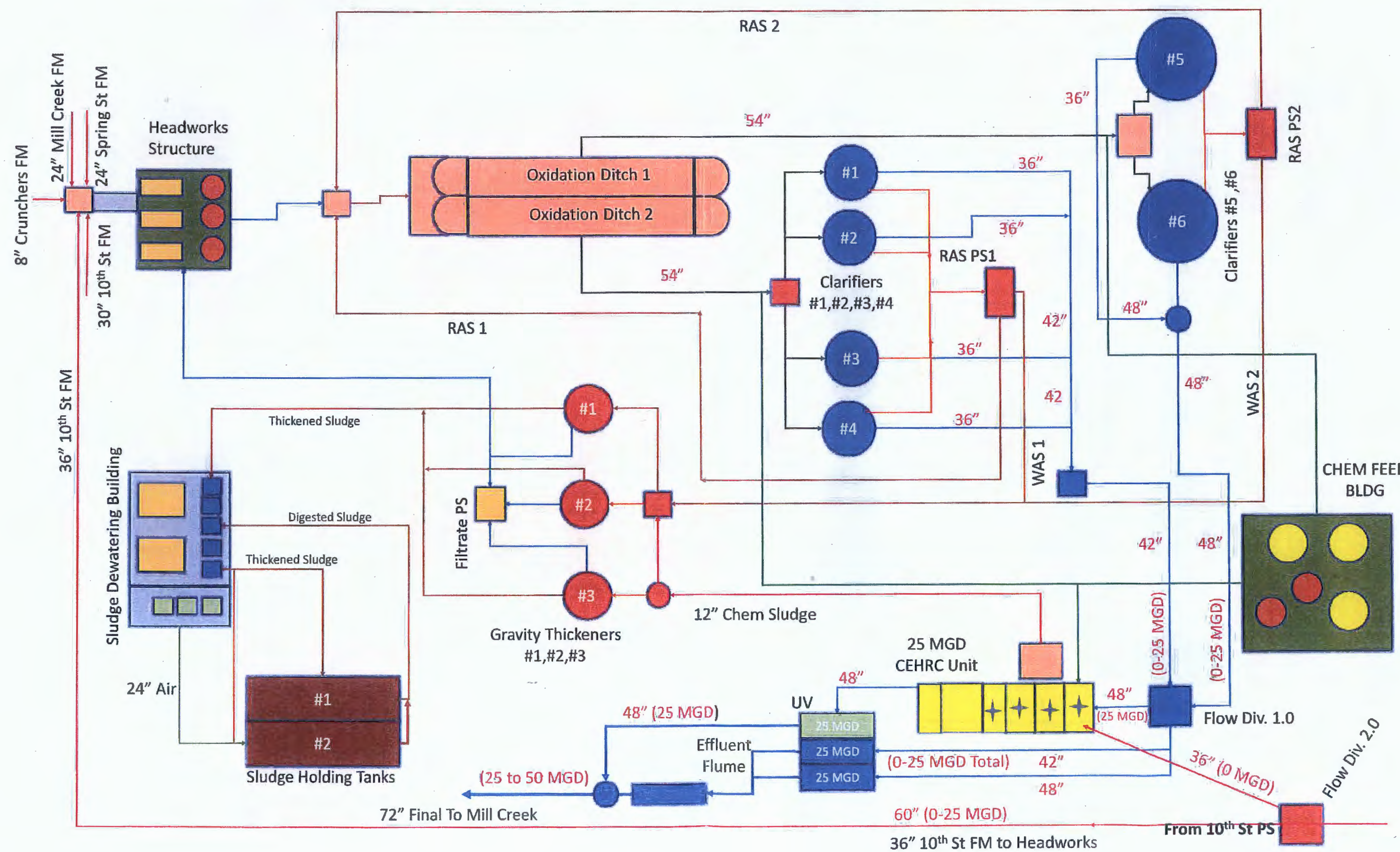


CUT OFF
+
ADD TO
IF AUGUST 1 2017 OR

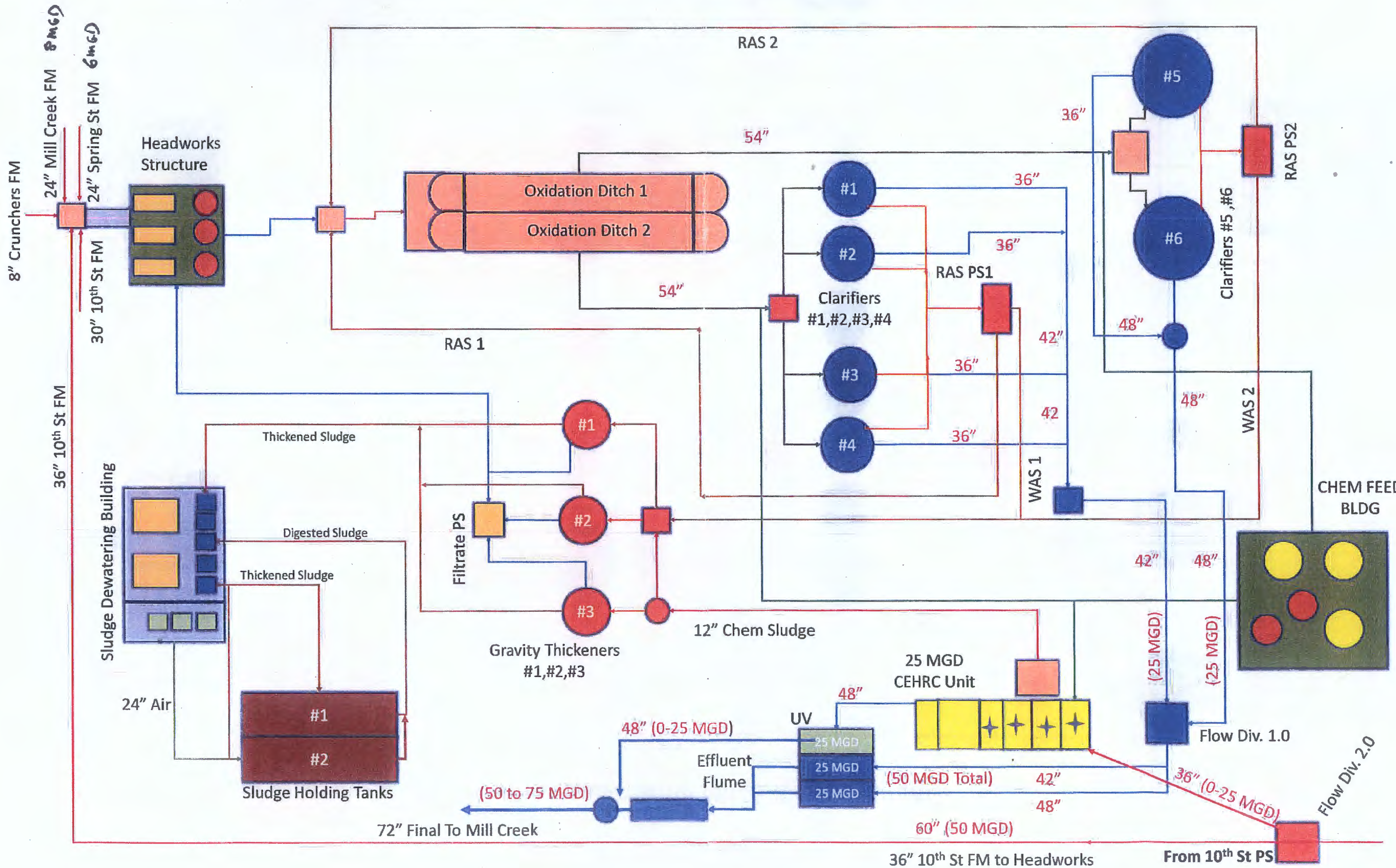
Downtown WWTP – Current Situation – Upto 50.0 MGD Flow



Downtown WWTP – Proposed Situation – Between 25.0 and 50.0 MGD Flow



Downtown WWTP – Proposed Situation – Between 50.0 and 75.0 MGD Flow



January 8, 2018

Dear Nigel,

Attached is the response to EPA's additional questions dated January 8, 2018. The City appreciates your attempts to set up a meeting and believes even more strongly than in the past that had the meeting in Jeffersonville taken place earlier, many of these questions would not have been asked. The City is also distressed by believing that it has come up with a plan that more than meets the goals of the original LTCP and the CSO Policy and yet does so at a less expensive cost, permitting the City to consider other projects that even enhance those goals. While there may be a small increase in the number of overflow events, who cares if they are only 10 gallons if the total flow captured in that year is more than 3 million gallons entering the Ohio River or Cane Run. That is our plan and it is endorsed by Clarksville which would get no relief if the original LTCP is followed.

This proposal is also predicated upon facts not known to the City, EPA, or IDEM when the original LTCP was developed. For example, no one could possibly have known that to construct interceptor as sized Chapter 10 of the LTCP, that the flow would be so low during dry weather that to eliminate potential problems with settled solids in the large storage interceptor that the design would require flushing mechanism at an additional cost of millions of dollars.

Finally, the City is concerned that it appears that EPA is not exactly aware of the history of the Jeffersonville LTCP. There are, for example, no outfalls identified as 019 and 020. They do not exist nor have they ever existed. Moreover, to ask question 16 shows that the author has no comprehension of the facts and has never read the October 24, 2017 memorandum that I sent to everyone concerning the 10th Street lift station capacity. In other words, the City doesn't want this process of endless questions being used to effectively end our proposal by paralysis by analysis.

There is some urgency in what the City has proposed. To obtain the necessary funds from the state Revolving Fund for the proposal, it is necessary to have all in place by April of 2018. This entails the revision to the previously approved Preliminary Engineering Report (PER) by the SRF Program, the redesign of the interceptor from the 80% design size to the proposed size (60" East/West and 72" North/South), having the construction plans approved by IDEM, going out to bid, securing the financing through SRF, and beginning construction.

In sum, the City understands if the goals of the original LTCP are not achieved it will remain under the Consent Decree. It knows it is dealing with models approved by EPA in the past. Yet, the old EPA attitude about requiring Consent Decrees before anyone has a grasp of the historical facts concerning any sewer system, such as Jefferson County, Alabama, and then, when a change is requested, and EPA responds by continually asking questions for certainty that only God would be able to answer. This must come to an end. It is called paralysis by analysis. I hope DOJ recognizes that the City is not asking for a dissolution of the Consent Decree. Far from it. It is only asking for it to be updated with facts nobody knew ten years ago with the development of newer engineering approaches to solve the problems. It believes it can better achieve the goals of the LTCP. But it cannot just sit answering questions from people who don't fully understand the Jeffersonville POTW or care to understand the engineering facts. Please understand that this City cares as much about the environment as did John Snow when he removed the handle to the Broad Street pump.

Sincerely yours,

Anson Keller
Counsel for Jeffersonville, IN